[0025] In addition to different compression levels, ROHC has three different operational modes: unidirectional mode (U mode), bi-directional optimistic mode (O mode), and bi-directional reliable mode (R mode), which are shown in the diagram of Figure 2. According to Figure 2, each compression level (IR, FO, SO) described above functions in each mode, but each mode functions in its own way on each level and also makes decisions on transitions between levels in its own way. The selection of the mode for each compression situation depends on the parameters of the used data transfer connection, such as the possibility to use a return channel, error probabilities and distribution, effects of variation in the size of the header fields.

[0026] In the unidirectional mode, data packets are transmitted from compressor to decompressor only, so the U mode of ROHC is useful in situations where the use of a return channel is not possible or desirable. In the U mode, transitions between different compression levels are made as a result of the expiration of certain sequential counters or on the basis of variation in the header field patterns. Because no return channel is used, compression in the U mode is less efficient and the disappearance of data packets on the transmission path more probable than in either of the bi-directional modes. Using ROHC is always started in the U mode and transition to either of the bi-directional modes can take place when the decompressor has received at least one packet and as a response to the packet, the decompressor indicates that a mode change is necessary.

[0027] The bi-directional optimistic mode is similar to the unidirectional mode with the exception that in the O mode, a return channel is used to correct error situations and to acknowledge significant context updates from the decompressor to the compressor. Sequential updates are not made in the O mode. The O mode is preferably suited for connections which require optimal compression efficiency with a small return channel traffic. The O mode provides a reasonably reliable data packet transfer, in which the synchronisation between the compressor and decompressor can typically be maintained well and data packets are seldom lost and if they are, in negligible numbers. At very high bit error rates, data packets can, however, be lost on the transmission path.

[0028] The bi-directional reliable mode differs clearly from the above-mentioned modes. The R mode uses a return channel to acknowledge

all context updates, also to acknowledge sequence number updates. Thus in the R mode, data packets can nearly entirely reliably be transmitted between the compressor and decompressor. Compressing header fields cannot cause the disappearance of data packets in the R mode. A drawback of the R mode is that the size of the header field is in some cases slightly larger than in the above-mentioned modes and that the return channel traffic increases considerably.

[0029] The three operational modes and three compression levels of ROHC form different operating situations for the compression of the header fields, each situation requiring the definition of the operation of the compressor and decompressor and the transmission of packets between them. ROHC uses different packets in different operating situations. At the moment, six different data packet types are defined for ROHC, four of which are used for transmission from the compressor to the decompressor and two as return channel data packets from the decompressor to the compressor. The number of used data packet types may change in the future, but all data packet types are characterized in that a context identifier CID defining the context used at each time is attached to each data packet before sending the packet to the transmission path.

[0030] The length of the context identifier CID is negotiated separately for each radio bearer by the compressor and decompressor. According to the ROHC definitions, the lower protocol layer (link layer) used at each time must provide a mechanism for the negotiation of the parameters, such as the length of the context identifier, used in header field compression. The parameters are negotiated before starting the compression and, in this connection, the length of the context identifier of the data packet flow can, according to prior art, be defined to be 0, 8 or 16 bits. On one logical data transfer channel, it is possible to transmit simultaneously several data packet flows whose contexts are identified and distinguished from each other by means of the context identifier CID. If only one data packet flow is transmitted on the channel, which is typical of different VoIP applications (Voice over IP), for instance, the length of the context identifier CID is made "small", i.e. given the value 0. However, even at this time it is possible by means of internal ROHC mechanisms to distinguish a maximum of 16 simultaneous data flows from each other, i.e. 15 new data connections can always be opened in addition to the original data flow, even though the length of the context

identifier CID was defined to zero. This is implemented in such a manner that the first data connection is always transmitted without any context identifier and to the following data connections, one byte is attached, whose first four bits indicate that this is a context identifier and the following four bits indicate the actual context identifier value. If, when defining the radio bearer, it is obvious that several data packet flows will be transmitted on the same channel, a large value, i.e. either 1 or 2 bytes (8 or 16 bits), is preferably defined as the length of the context identifier depending on the application, data transmission protocol and channel conditions used on the radio bearer.

[0031] One telecommunications system, to which the header field compression method according to the ROHC specifications is to be applied, is a third-generation mobile system, also known as UMTS (Universal Mobile Telecommunication System) and IMT-2000 (International Mobile Telephone System). In the following, the structure of the UMTS system is described in a simplified manner on the basis of Figure 3.

[0032] Figure 3 only contains the blocks essential for explaining the invention, but it is obvious to a person skilled in the art that a conventional mobile telephone system also comprises other functions and structures, which need not be described in greater detail herein. The main parts of a mobile telephone system are a core network CN, a UMTS mobile telephone system terrestrial radio access network UTRAN, which form the fixed network of the mobile telephone system, and a mobile station or user equipment UE. The interface between CN and UTRAN is referred to as Iu and the air interface between UTRAN and UE is referred to as Uu.

[0033] UTRAN typically comprises several radio network subsystems RNS, the interface between the RNSs being referred to as Iur (not shown). RNS comprises a radio network controller RNC and one or more base stations BS, also referred to as nodes B. The interface between RNC and BS is referred to as Iub. The base station BS typically takes care of radio path implementation and the radio network controller RNC manages at least the following: management of radio resources, control of handover between cells, power adjustment, timing and synchronization, paging the subscriber terminal.

[0034] The core network CN is made up of an infrastructure belonging to a mobile telephone system and external to UTRAN. In the core network, a mobile switching centre / visitor location register 3G-MSC/VLR is connected to a home location register HLR and preferably also to a service